Minetech, Volume 25, No. 6, P 53-56 Nov.-Dec., 2004

NEW APPROACH TO RAISE SURVEY

Amar Prakash*, K. B. Singh*, K. K. K. Singh* and R. D. Lokhande**

उत्थित सर्वेक्षण स्तर से स्तर के सम्बंधों का मिलान है अर्थात् इस सर्वेक्षण में स्टोप्स एवं ब्लॉक्स के आयोजन एवं रेखांकन जैसे कामों के लिए स्तरों को एक दूसरे पर अध्यारोपण करने का काम किया जाता है। स्तरों अथवा नक्शों के अध्यारोपण की सटीकता उत्थित सर्वेक्षण की सटीकता पर निर्भर करती है।

चूंकि उत्थित सर्वेक्षण एक थकाऊ और बोझिल कार्य है, अत: हट्टी स्थित हट्टी गोल्ड माइन में इसके लिए एक अभिनव तकनीक का विकास कर उसका प्रयोग किया गया है जो स्वीकार्य सीमा के अन्दर बड़े उपयोगी परिणाम देती है। आलेख में इस तकनीक पर प्रकाश डाला गया है।

INTRODUCTION

There are nine parallel-mineralised bands from east to west in Hutti Gold Mines, Hutti, located in Raichur district (LC Curtis, B. P. Radhakeishna and G. K. Naidu; 1990). All the reefs are steeply dipping ranging from 70 to 90°. The levels, vertically at 33m interval, are connected by shafts and raises. The raises (connection between two levels in an ore body driven in an upward direction (Deshmukh D. J; 1988)) are developed at 50 to 60m intervals in the reef. The introduction of mechanisation immensely increased the quantum of raise survey i.e., correlation survey for accurate planning and designing of mechanised blocks. The various methods of correlation (Oglobin D.N., Gerasimenko G.Y, Nikolsky S.T., Paapazov M.G. & Travnik S.F) are as follows:

a) Direct traversing

b) Optical transfer

c) Shaft plumbing

1) One wire in two shafts

2) Two or more wire

I) Exact alignment

II) Weisbach

III) Weiss Quadrilateral

Raise/ winze survey can be carried out by various methods stated above, depending upon the field conditions i.e., inclination, dimension of raise, distance between two levels and space around the raise etc.

RAISE / WINZE SURVEY

On an average, the distance between the two raises varies from 50 to 60m. The sub-levels are developed from one end of the middle of raise and intersect the other raise. If the width of the ore body is quite large there is a possibility of missing the puncturing of the other raise. It becomes imperative to impart the correct orientation of the development of the sub-level and this can only be possible through raise survey.

PRINCIPLE OF NEW TECHNIQUE

The principal of new technique is basically a combination of Exact Alignment method and Weisbach method but there is a slight alteration in the process of Exact Alignment method.

In Exact Alignment method, (Ghatak S; 1998) the theodolite has to be set in such a position so that the line of sight should exactly align with plumb lines i.e., the theodolite and two pegs lie in same plane. Achieving this position is practically difficult. Hence, alteration in this method has been made following certain steps as explained later.

*Scientists, Central Mining Research Institute, Dhanbad – 826001
** JSA, Central Mining Research Institute, Dhanbad – 826001

PREPARATORY WORK

The involvement of the preparatory work in this method is very less in comparison to the other methods. The major work is to: -

1) Fix a wooden plank in main level/top level above the raise which is required for fixing the survey peg as shown in fig.1

2) Fix single survey peg/nail to it (say W1)

PROCESS OF SURVEY

To carry out the survey work the following steps has to be followed as stated below:

1) Set theodolite at Wb in sub-level below the raise in such a position so as to cover maximum area of visibility, shown in Fig.1

2) Suspend a plumb to a new survey peg S1 in sub level/ bottom level and tie a knot to it.

3) Backsight S1. Adjust the knot in the line of collimation. Attach eyepiece to the rear end of telescope and backsight S1 again to check the proper attachment of eyepiece.

4) Measure the distance from knot to peg and form peg to floor/rail. This is done for the calculation of the reduced level of roof and floor at S1.

5) Measure the distance from knot to instrument.

6) Foresight W1 survey peg. Take horizontal and vertical angles. Inclined distance is measured. There is no need to suspend the plumb wire, as the hole of the survey peg can be foresighted directly. A plumb of length 0.2 to 0.3m may be suspended if the hole of the survey peg is not visible owing to any obstacles on the way.

7) Keeping the horizontal angle same, change the vertical angle to maintain the same plane by releasing vertical clamp.

8) Initially locate a new point with pin as directed by the surveyor and fix the survey nail (W2) as far as possible from W1 peg. Align the (W2) peg by slightt tapping as per the direction given by the surveyor through telescope. Check once again the alignment of W1 and W2 survey pegs only by changing the vertical angle. Now the instrument or line of sight, W1 & W2 pegs are perfectly aligned. Two reading are taken (one at face left and another at face right).

9) Then Weisbach method is carried out in the main level as shown in Fig. 2. There is no need to suspend the plumb wire upto the sub-level. Plumb wire can be suspended upto drive height itself, so as to bring the wires to stationary position quickly.

10) Set the theodolite almost in the line with W1 & W2 pegs say at T1, so that the Weisbach angle should not exceed 2 minutes.

11) Backsight the known survey peg (say L10) and fix a knot in line with the line of sight. The height from peg to knot is measured in order to transfer the RL to sub-level, as the RL of L10 is known.

12) For the sake of accuracy the average of six times the measurement of angle is taken.

13) Take horizontal angle with respect to L10 to one of the peg W1 or W2.

14) Measure horizontal distance from L10 to instrument as well as to the plumb wires W1 & W2. Measure the height of W1 (nail) with respect to the line of sight.

15) Set the instrument at L10. Backsight L9 and foresight T1 in order to connect the traverse from main level to sub-level.

DISCUSSION

Normally in raises the flow of air is high. So the method of correlation by the suspension of long wire(s) from level to level or sub-level may not impart satisfactory result. If the ventilation is stopped in raise, working condition in the sub-level will be very bad thereby hampering the production. The innovative technique of raise survey eliminates the suspension of long wires and makes the survey work to be carried out in easy and fast way.

We come across various pragmatic problems when we carry out the above methods of raise survey as sated below:-

1) When long plumb wire(s) are required to be suspended from level to level ventilation has to be stopped. Surveyor has to work in sluggish condition, which leads to tiredness soon.

2) As the plumb wires do not come to dead still position more concentration is required to get the average reading.

3) Time consumption is high.

4) Requirement of lots of preparatory work before survey i.e., preparation of double stages at the top of the raise, one for the surveyor to stand and another for keeping the instrument. There is restriction in the movement of surveyor.

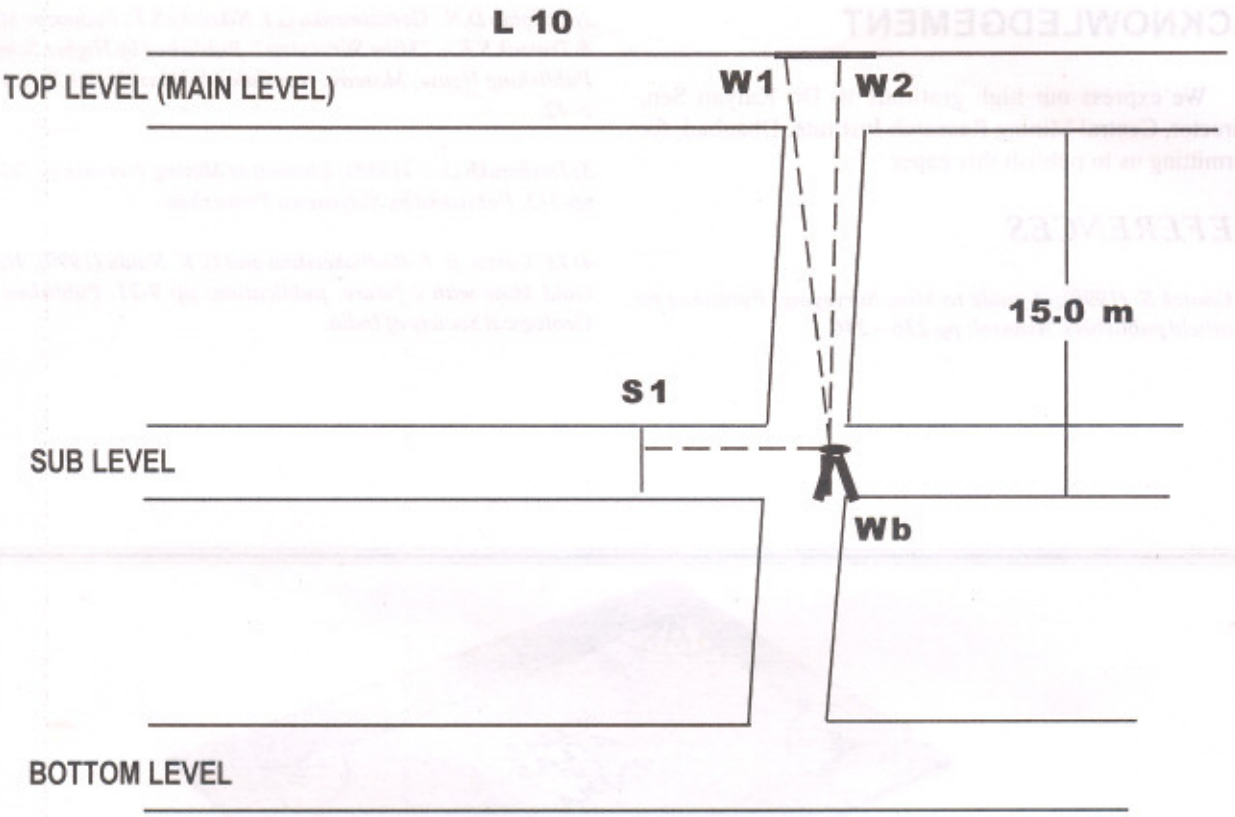

Fig. 1 : Longitudinal section view of main levels and sublevel showing the position of the survey station.

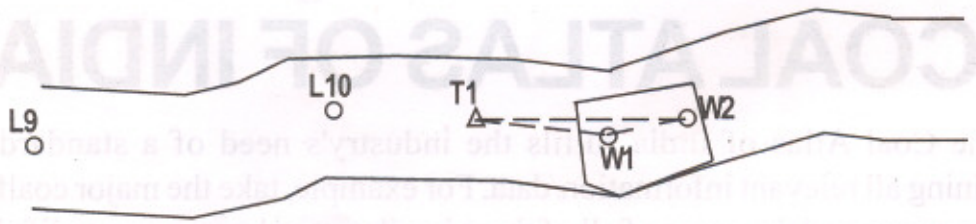

Fig. 2 : Plan of main level showing Weisbach Method

5) When Zenith prism is used the alignment and fastenings of prism consumes much time for taking face left and face right readings. It has to be detached and re-aligned after transmitting the telescope. Slight error in alignment leads to incorrect horizontal reading.

6) In case of assumed bearing method survey cannot be carried out during the development of sub-level.

In order to overcome the above-mentioned problems an innovative technique of raise survey has been developed.

CONCLUSION

The new approach of raise survey is quick and less strenuous compared to other methods. This method of raise survey can be adopted in any inclination of the raise to vertical raise. This new technique of raise survey has been carried out in Hutti Gold Mines, Hutti, Karnataka, in various sub-levels, which imparted impressive and encouraging results. The survey has been closed after the completion of sub-level and the closing error is much within the permissible limit.

ACKNOWLEDGEMENT

We express our high gratitude to Dr. Kalyan Sen, Director, Central Mining Research Institute, Dhanbad, for permitting us to publish this paper.

REFERENCES

1) Ghatak S. (1998): A guide to Mine Surveying, Published by Coalfield publishers, Asansol; pp 236 – 246.

2) Oglobin D.N., Gerasimenko G.Y, Nikolsky S.T., Paapazov M.G. & Travnik S.F. – "Mine Surveying", Published by Higher School Publishing House, Mascow, translated by Mashkevich R.; pp 32 c- 42.

3) Deshmukh D. J. (1988); Element of Mining Technology Vol-2; pp-515, Published by Vidyasewa Prakashan.

4) LC Curtis, B. P. Radhakeishna and G. K. Naidu (1990); Hutti Gold Mine with a future, publication; pp 9-21. Published by Geological Society of India.